U7860-1

Business In Nebraska

December 1989
Vol. 45 No. 543

Prepared by the Bureau of Business Research
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University of Nebraska-Lincoln
Lincoln, NE 68588-0406
402/472-2334

The Uruguay Round and the Nebraska Economy: Part II

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Last month's *Business in Nebraska* presented estimates of the price changes that would follow hypothetical liberalization of trade in agricultural products. Despite the uncertainties surrounding the Uruguay Round and other agricultural market conditions, it is nevertheless worthwhile to consider the effects of trade liberalization. Estimates of the impact on prices, incomes, and employment, although not accurate predictions of the future, provide a systematic way of evaluating the U.S. situation.

The estimates last month consider liberalization effects in isolation and ignore other important changes in agricultural markets. Alterations in climate, soil and water depletion, technological advances, new set-aside policies, variance in purchasing by socialist and developing countries, and macroeconomic variables such as interest rates and exchange rates easily could overwhelm the effects of liberalization in coming years.

Liberalization itself is problematic. The U.S. has called for elimination of export subsidies, import restrictions, and other supports for domestic prices over ten years. There has been no meaningful bargaining to date in the agriculture negotiating group meetings of the General Agreement on Tariffs and Trade (GATT). The Director General of GATT characterized the activities of participants in the Uruguay Round as "grand-standing." Insiders predict that the self-imposed negotiating deadline of December 1990 must be extended if the Uruguay Round is to conclude successfully.

Price Changes in Review

International prices of all important Nebraska agricultural products would rise as a result of liberalization, but the impact on domestic support prices would be mixed. Based on 1986-1987 conditions, Roningen and Dixit predict that only beef and pork prices would rise. MacPhee estimates for 1989 show that only corn, sugar, and wheat prices would fall. Because the results are sensitive to market conditions such as drought and agricultural policies at home and abroad, further analysis will utilize both sets of estimates. The reader must judge whether the future more closely will approximate 1986-1987 or 1989.

The price estimates show the total effect of liberalization, rather than the annual changes that would be more likely to occur as the staged reductions in import restrictions, export subsidies, and domestic price supports were removed gradually over a ten year period. Because most Nebraska economic variables are measured on an annual basis, it is more useful to estimate the impact of annual price changes. The two price scenarios for major Nebraska ag products are shown in column (a) of Table 1.

State Economic Scoreboard

Change from same month one year ago.
See Review and Outlook on page 8 for more details.

	State	Metro+	Nonmetro
Motor Vehicle Sales (August) Constant $	↑ 6.7%	↑ 11.1%	↑ 3.0%
Nonmotor Vehicle Sales (August) Constant $	↑ 0.7%	↑ 1.1%	↑ 0.3%
Building Activity (August) Constant $	↑ 0.1%	↓ -1.4%	↑ 2.1%
Employment (October)	↓ -0.5%	↓ 0.0%	↓ -1.0%
Unemployment Rate* (October)	↓ 2.7%	↓ 2.8%	↓ 2.7%

+Omaha and Lincoln. *Unemployment is this month's rate, not a percent change from year ago.

Table 1
Annual Changes in Prices, Nebraska Production, and the Values of Farm Output and Income After Agricultural Trade Liberalization

	Price Change (percent) (a)	Production Change (percent) (b)	Change in Gross Value of Nebraska Farm Income (percent) Without Production Change (c)	With Production Change (d)	(\$ millions) Without Production Change (e)	With Production Change (f)	Change in Net Farm Income (\$ millions) Without Production Change (g)	With Production Change (h)
Under 1986-1987 Domestic and International Market Conditions:								
Beef	0.7	0.4	0.7	1.1	33.7	53.0	33.7	38.6
Corn	-3.2	-0.4	-3.2	-3.5	-69.9	-76.4	-69.9	-74.2
Pork	0.5	0.0	0.2	0.5	3.7	3.7	3.7	3.7
Sorghum	-3.7	-0.4	-3.7	-3.9	-10.4	-10.9	-10.4	-10.6
Soybeans	-1.2	0.2	-0.7	-1.0	-7.1	-5.9	-7.1	-6.2
Sugar	-6.9	-4.2	-6.9	-8.2	-3.5	-4.1	-3.5	-3.6
Wheat	-4.4	-0.6	-4.4	-5.0	-14.0	-16.0	-14.0	-15.5
Under 1989 Domestic and International Market Conditions:								
Beef	0.5	0.30	0.5	0.8	24.1	38.6	24.1	28.4
Corn	-0.5	-0.4	-0.5	-0.9	-10.9	-19.7	-10.9	-17.5
Pork	0.1	-0.0	0.1	0.1	0.7	0.7	0.7	8.1
Sorghum	0.1	-0.1	0.1	0.0	0.3	0.0	0.3	0.0
Soybeans	2.0	1.7	2.0	4.0	11.8	23.6	11.8	21.2
Sugar	-3.5	-1.7	-3.5	-4.6	-1.8	-2.3	-1.8	-2.1
Wheat	-0.1	0.2	-0.1	0.2	-0.3	-0.6	-0.3	-0.4

(a) See Vernon O. Roningen and Praveen M. Dixit, *Economic Implications of Agricultural Policy Reforms in Industrial Market Economies*, United States Department of Agriculture, Economic Research Service, Agriculture and Trade Analysis Division, Staff Report No. AGES 89-36, (August 1989); and Craig R. MacPhee, "The Uruguay Round and the Nebraska Economy: Part I," *Business in Nebraska*, 45, no. 542 (November 1989), pp 1-3. Changes are expressed as a percent of the base support price
(b) See Roningen and Dixit for 1986-1987 and for elasticities used to calculate the results for the 1989 case
(c) If production does not change, then the percentage change in gross farm value of output equals the percentage change in price
(d) Percentage changes in gross farm value equals the sum of columns (a) + (b) + (a)(b)
(e) and (f) The product of columns (c) and (d) and 1988 gross farm values of production
(g) and (h) See text for computation method

Production Changes

How responsive is Nebraska farm output to price changes? Roningen and Dixit surveyed national statistical studies for elasticity estimates. The elasticities reveal the percent change in production in response to each one percent change in price. For example, they conclude that a one percent increase in the prices of sorghum, soybeans, or wheat would lead to 0.6 percent increase in production. Their elasticities were 0.5 for corn and sugar, 0.65 for beef, and 1.0 for pork.

These elasticities are applicable when only one price changes, but across-the-board liberalization changes many prices. To account for the other changes, other elasticities are necessary. Roningen and Dixit conclude that a one percent fall in the price of corn would raise pork production by 0.27 percent and increase wheat production by 0.25 percent. The relevant elasticities from Roningen and Dixit were used to calculate column (b) in Table 1.

Are national estimates of elasticities applicable to Nebraska production? Azzam, Yanagida, and Linsenmeyer estimate production equations for corn, cattle, and hogs from which the following elasticities could be derived: corn 0.0, cattle 1.05, and hogs 0.33.[1] With the exception of cattle, these elasticities are somewhat lower than those of Roningen and Dixit. This implies that Nebraska corn and hog farmers are less responsive to price changes than other farmers in the United States. Because there is no complete set of elasticities for Nebraska, however, the Roningen and Dixit estimates are retained. An alternative assumption of zero elasticities also is employed. Zero elasticities imply that Nebraska farmers make no change in production in response to a price change.

Changes in the Value of Farm Production

The value of crops and livestock produced by Nebraska farmers equals the product of price and quantity. Therefore, the foregoing percentage changes can be used to determine the changes in the gross value of output. Estimates in percentage terms for zero elasticities and for Roningen and Dixit elasticities are shown in columns (c) and (d) of Table 1.

All estimates show that the total value of Nebraska output of beef and pork would rise while that of sugar and corn would fall. In general, the values would fall more or rise less under the 1986-1987 scenario, because in those years international prices were far below domestic support prices. Under the conditions prevailing in 1989, the changes in the value of production are a fraction of one percent for all products except sugar and soybeans. The scenarios differ the most for soybeans, because international prices for that commodity are much higher in 1989 than in 1986-1987.

In order to estimate the impact of the Uruguay Round on the total value of farm production in Nebraska, the percentage changes in Table 1 have been applied to estimates of gross farm receipts by product for 1988. Direct government payments and inventory accumulation have been added to cash receipts; payments such as conservation bonuses were allocated to each crop on a pro rata basis. The results in columns (e) and (f) of Table 1 show that corn production is the biggest loser, falling \$10 million to \$76 million in value per year, depending on the scenario. Beef production is the largest gainer, rising \$24 million to \$53 million in value each year. Overall, the value of the seven agricultural products would fall \$56 mil-

lion to $67 million under 1986-1987 conditions, but they would rise $24 million to $42 million under 1989 conditions. These numbers suggest that liberalization would make the value of Nebraska farm output sensitive to variations in world prices.

Changes in Net Farm Income

To assess the impact of agricultural liberalization on the Nebraska economy, the analysis in this article uses relationships derived from the Nebraska econometric model developed by Professor James R. Schmidt of UNL. This model approximates the behavior of net income variables for the state. This means that net farm income changes also must be estimated. Net farm income is defined as the sum of labor earnings and proprietor earnings. The value of farm output, including direct government payments and imputed home rent and consumption, is reduced by all expenses except labor in order to calculate net farm income.

Estimation of the change in net farm income from liberalization also requires calculation of the change in expenses that vary with farm production. An assumption is made that variable costs include all expenses except rent, interest, depreciation, and property taxes. If land prices and rents change following liberalization, the impact on the current net income of farmers would be smaller than estimated.

On the basis of USDA data for Nebraska, it is estimated that variable costs account for 25 percent of crop values and 75 percent of livestock production values.[2] It is assumed that these expenses vary proportionately with output. For example, a one percent drop in livestock production is assumed to reduce variable costs by 0.75 percent. In the case of no alteration in production, the change in net and gross incomes are equal. Estimates appear in columns (g) and (h) of Table 1.

Aggregate Effects on the Nebraska Economy

The net income changes for the seven major Nebraska farm products are summarized in column (a) of Table 2. Although these changes look substantial in dollar terms, they range only from -3.6 percent to +1.6 percent of 1988 Nebraska net farm income. Because the analysis refers to staged liberalization, the changes would continue for ten years. Coefficients from the Nebraska econometric model predict that these changes in farm income would alter total personal income in the state more in dollar terms because of a multiplier effect. Nevertheless, the changes in column (b) of Table 2 are also relatively small, ranging from -0.5 percent to +0.25 percent under 1986-1987 and 1989 conditions. Similarly small changes would be experienced each year for retail sales and employment.

Can Nebraska weather the ag liberalization storm? Recent history suggests that it can. During the 1980s, average year-to-year variationsexceeded $400 million in net farm income and $1.1 billion in personal income, several times the maximum annual impact of the Uruguay Round.

Income effects on farmers and their suppliers are not the end of the story. Roningen and Dixit estimate that the consumer and government savings from liberalization would amount to $150 per capita spread over ten years. These savings translate into a benefit for Nebraska of $24 million per year, which would lower the initial net real income loss to about $44 million in the 1986-1987 scenario. Under the 1989 scenario, consumer prices would rise, costing Nebraska households about $3.3 million more per year. Liberalization of trade in services and industrial goods in the Uruguay Round could benefit other Nebraska exporters and consumers.

Conclusion

The hypothetical analysis in this article is encumbered by many assumptions—the numbers can make no pretense of accurately describing Nebraska's future. Nevertheless, they do reveal rough orders of magnitude for what Nebraskans may expect from complete agricultural trade liberalization. They suggest that the impact would be relatively small in comparison to recent historical experience. They also imply that the impact would differ markedly under different international and domestic agricultural conditions.

If government wants to insulate farmers from this potential instability in net farm income, it could employ policies that would compensate farmers without altering prices. Government payments that are decoupled from production levels would be one policy choice, although a more palatable alternative may be the production entitlement guarantee (PEG). This so-called PEG proposal would set the quantity of output eligible for subsidy at less than liberalized production levels. No incentive to expand production and depress market prices would exist with the PEG, but subsidies per unit could be adjusted to compensate farmers for any adverse impact of trade liberalization.[3]

Endnotes

1. Azzeddine M. Azzam, John F. Yanagida and Dean Linsenmeyer, "A Linked Econometric Model of the Livestock-Feed Sectors in Nebraska and the Rest of the United States," *North Central Journal of Agricultural Economics*, 9, no. 2 (July 1987).

2. United States Department of Agriculture, Economic Research Service, Economic Indicators of the Farm Sector: State Financial Summary, 1988, ECIFS 8-2.

3. For more information on the PEG, see Mark Drabenstott, Alan Barkema, and David Heeneberry, "Agriculture and the GATT: The Link to U.S. Farm Policy," Federal Reserve Bank of Kansas City *Economic Review* (May 1989), pp. 3-24.

Table 2
Annual Changes in Nebraska Economic Activity After Agricultural Trade Liberalization
($ millions and number of employees)

	Net Farm Income Change (a)	Personal Income Change (b)	Retail Sales Change (c)	Nonagricultural Employment Change (d)	Agricultural Employment Change (e)
Under 1986-1987 Domestic and International Market Conditions.					
Without production change	-67.4	-128.1	-45.7	-748	-47
With production change	-67.8	-128.8	-45.9	-752	-48
Under 1989 Domestic and International Market Conditions.					
Without production change	24.0	45.6	16.3	266	17
With production change	31.3	59.5	21.2	183	22

Irrigation and Related Issues

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Nebraska's abundant water supply and semiarid conditions are main historical reasons for the state's impressive growth in irrigated agriculture. Irrigated agriculture in Nebraska has made the state one of the nation's leading producers of agricultural products. In 1985 Nebraska ranked third behind Illinois and Iowa in the production of corn for grain. In 1985 over 80 percent (or 715 million bushels of corn) was produced on 5.1 million acres of irrigated land in Nebraska, representing 27 percent of the state's total land devoted to crop production. In that same year, cash receipts from all livestock marketing totaled over $4.1 billion. Irrigation also has been a major contributor to the growth of livestock production in Nebraska.

The economic future of many Nebraska communities, especially those located in the central and western parts of the state, largely depends on irrigated agriculture. Earlier articles in this publication reported the economic importance of irrigation to the state's economy. The net contribution or net economic impact of irrigated agriculture to the state's economy exceeds $1.3 billion annually. A substantial portion of this impact represents business revenues. These revenues would vanish with the loss of irrigated agriculture. It is likely that a number of communities in central and western Nebraska would disappear in the long run if there were no irrigated agriculture.

Major challenges facing Nebraska as the state moves into the 21st century are to limit groundwater depletion, to protect the quality of groundwater, and to resolve possible conflicts between water development projects and the maintenance of instream flows for fish and wildlife.

This final article examines some of the issues surrounding these challenges . . . issues such as contamination, domestic use, conservation, and general water policy.

The material presented here draws on the work of several notable scientists and water experts. These individuals include Professor David Aiken of the UNL Department of Agricultural Economics, a noted authority on water policy and water law; Professor Dean Eisenhauer from the UNL Department of Agricultural Engineering, an expert in water conservation; Professor DeLynn Hay also from the UNL Department of Agricultural Engineering, a specialist on domestic water use; and Professor Roy Spalding, Associate Director of the UNL Water Center, who is an expert on water contamination.

Contaminants

Contaminants can be classified as any physical, chemical, biological, or radiological substance or matter in water. Because water is an excellent solvent, most of the materials that it touches during the natural processes of precipitation, runoff, percolation, and storage contribute to contamination.

Many of the major water quality problems currently faced in Nebraska result from human activities such as agriculture, waste disposal, industrial operations, chemical storage, and well location construction. Some of today's problems, however, result from activities that occurred many years ago.

Contaminants of primary importance in Nebraska water are bacteria, nitrates, radioactive chemicals, selenium, sulfate, organic chemicals such as industrial solvents and pesticides, and others. Two agricultural contaminants receiving particular attention in the press are nitrates and pesticides.

A 1974 study of water quality in 511 wells in the central Platte region of Nebraska (covering parts of Custer, Dawson, Buffalo, Hall, and Merrick counties) indicated the presence of large areas where nitrate-nitrogen levels in the groundwater exceeded the ten parts per million maximum contaminant level (MCL) set by the U.S. Environmental Protection Agency (EPA). The 1974 study showed that groundwater contamination in the central Platte region was confined to the area east of Kearney.

In 1984, 78 percent of the 511 wells sampled in 1984 were resampled for nitrate presence. In general, there were dramatic increases in the spatial distribution of nitrates. Nitrate-contaminated groundwater no longer was limited to the area east of Kearney. The areal contamination east of Kearney also had increased. By 1984, the resampled wells showed that more than 500,000 acres of land in the central Platte region had groundwater with nitrate-nitrogen concentrations in excess of the ten parts per million MCL set by EPA.

Although the central Platte region is the largest and most intensely studied nonpoint, nitrate-contaminated groundwater area in the United States, it is not the only region in Nebraska contaminated by nonpoint sources of nitrate. Approximately 180 square miles of northern Holt County have nitrate-contaminated groundwater.

Groundwater in the central Platte region also has been analyzed for pesticide contamination. A 1978 analysis of water samples from wells in the region indicated

the presence of atrazine. For a large majority of the groundwater samples, the concentration of atrazine was greater than 0.02 µg/1. Alachlor was the only other pesticide detected in the groundwater of the central Platte region, but its presence was less frequent than that of atrazine.

From 1979 through 1984, several plots were selected in Buffalo, Hall, and Merrick counties in the central Platte region to demonstrate management practices to local farmers that reduce nitrate leaching without sacrificing crop yields. Using these improved management practices may slow contamination from agricultural chemical use.

Domestic Water Use

Approximately 80 percent of Nebraska's population depends on public water supplies for their domestic water supply.

The Nebraska Department of Health, the state agency administering the Nebraska Safe Drinking Water Act, divides public water systems into community and noncommunity systems. The Safe Drinking Water Act regulates any water system that services more than 25 persons daily or has more than 15 service connections.

Nebraska currently has 674 community water systems; 464 are municipal systems, and the remaining 210 systems include rural water districts, subdivisions, sanitary and improvement districts, mobile home parks, and similar groups. There are 467 public water supplies classified as noncommunity, transient systems. This classification includes rest stops and highway restaurants with their own water supply. The category of nontransient, noncommunity public water systems contains 285 systems and includes schools and industrial facilities.

Nebraska communities depend almost entirely on groundwater as the source of water supply. It has been estimated by the U.S. Geological Survey that 82 percent of Nebraska's population receives water from groundwater supplies. The 1985 estimates indicated that groundwater provided 84.1 percent of the total public water supply and 89 percent of domestic deliveries from public supplies. Essentially all of the self-supplied domestic use in Nebraska is from groundwater.

Although Nebraska has an abundant groundwater supply, that supply is not distributed uniformly. As a result, many communities have had problems developing reliable sources of groundwater. Only five water systems divert surface water for part or all of their supply. These systems are Blair, Crawford, Beaver Lake Home Owners Association, the Cedar-Knox Rural Water District, and the Metropolitan Utilities District which serves Omaha. Surface water must be treated in order to deliver safe, potable water to the consumer. This treatment results in increased costs, but delivering treated surface water is generally comparable in cost to delivering treated groundwater.

Many of the current problems faced by both community water systems and individuals with private wells are related to water quality.

Contaminants in water can be classified as those that adversely affect human health and those that adversely affect the aesthetic and economic value of water. As noted earlier, contaminants of primary importance in Nebraska water are bacteria, nitrate, radioactive chemicals, selenium, iron, manganese, sulfate, and organic chemicals such as industrial solvents and pesticides. The Safe Drinking Water Act has expanded the number of contaminants that public water supplies must monitor. This expanded monitoring helps to insure a safe water supply, but adds considerable economic cost to the product. Public water supply systems are going to face increasing economic and social problems in managing their systems in order to meet the water quality requirements of the Safe Drinking Water Act.

Although Nebraska has abundant water supplies, many communities will face problems in the future providing adequate, good quality water. Communities depend economically on many of the same sectors such as agriculture and industry with which they must compete for water. This competition will become more severe when a community must seek new supplies to address quantity or quality problems.

Some studies have shown that community water quantity problems relate to seasonal lowering of groundwater levels caused by irrigation withdrawals and diminishing flows in rivers and streams that recharge aquifers used as sources for municipal supplies. Irrigation pumping around a rural community can produce a gradual lowering of the water level due to mining of the groundwater and, in some cases, larger temporary declines during the irrigation season. Water management in these situations must consider carefully the needs of both the community and agriculture.

Much of the state's population is served by aquifers that are recharged by adjacent rivers or streams. For example, the well fields of Grand Island, Fremont, Lincoln, and Omaha induce recharge directly from the Platte River. Groundwater storage is sufficient to maintain municipal withdrawals during occasional periods of low flows in the Platte River, as long as there are sufficient flows to recharge the aquifer during the remainder of the year.

The communities withdrawing water from the aquifer's associated streams are concerned about the impact of additional upstream withdrawals. These communities are interested in being able to determine the minimum stream flows needed for supplying existing well fields and sites that may be used for future development. New legislation would be required in order to provide and maintain such minimum instream flows. With recent reports about pesticides in surface waters, questions also are being raised about the impact of the quality of the recharging stream on the aquifers being used for public water supplies.

Water Conservation

Nebraska has about 8 million acres of irrigated cropland. Approximately 10 million acre-feet of water, mostly groundwater, are used annually to irrigate this area. About 94 percent of the total groundwater withdrawn in the state is used for irrigation. In addition, about 100,000 acre-feet of water are used for turf grass irrigation to enhance urban and residential environments. Water is a limiting factor to production on about 12 million acres of rain-fed cropland in the state. Drought conditions always exemplify the need for adopting water conservation practices for more efficient crop production and for maintaining water supplies.

Groundwater users are faced with higher energy costs for lifting water, regional declines in supply, and agricultural chemical contamination. A significant portion of Nebraska's precipitation be-

comes runoff and is lost for crop use. Runoff also causes soil erosion.

Integrated water management (IWM) can provide efficient and wise use of the state's available water resources and, at the same time, provide protection for the quality of water. IWM provides a way to integrate irrigation, tillage, cropping, pest control, and structural practices into an economically efficient management system for conserving water.

Research and demonstration projects recently conducted in Hall, Buffalo, Holt, and Antelope counties show that from 8 percent to 11 percent of the water applied for irrigated crop production can be saved using scientifically based irrigation scheduling methods. In addition, another 15 percent potentially could be saved by improvements in surface irrigation efficiency that would reduce runoff and deep percolation of water below the crop root zone.

Irrigation scheduling methods are based on either soil moisture measurement, estimation of crop water use using real time weather information and measurement of rainfall and irrigation applications, stage of crop development, or measurement of plant water stress. Stage of growth scheduling is a relatively simple procedure and takes advantage of knowledge about the sensitivity of the crop to moisture stress in each growth stage. It is applied best on deep medium-to-fine textured soils. Modern stage of growth methods adjust the irrigation schedule in accordance to rainfall.

Plant water stress methods integrate many factors that occur simultaneously. Plant stress is dependent not only on soil moisture conditions, but also on weather factors (temperature, wind, etc.). One relatively new plant water stress method is based on plant leaf temperature. Infrared thermometers can be used for this measurement. Although this technology shows promise, procedures for application to an entire field need to be developed and refined.

The crop water use method is gaining in popularity due to the relatively easy access to this information through the news media. A statewide automated weather station network provides the weather data needed to calculate water use through the state. This information is used in a checkbook procedure where crop water use is viewed as a withdrawal from the soil moisture account and irrigation and rainfall are viewed as deposits from the account.

Accurate measurement or estimation of irrigation and rainfall is important to make the method work satisfactorily. Knowledge of the irrigation system efficiency also is needed. As a result, the procedure is easier to apply with sprinkler systems (center pivots, etc.) than with surface irrigation methods (gated pipe and siphon tubes).

Soil moisture measurement methods have existed a long time. These methods include soil probing (then estimating soil moisture by its feel and appearance), electrical resistance blocks, and tensiometers. Due to its simplicity and relatively low cost, the soil probe method is used most commonly. Electrical resistance blocks are best applied on medium-to-fine textured soils, while tensiometers are best applied on coarser textured soils.

Approximately 50 percent of Nebraska's irrigated area is irrigated with surface methods, while sprinklers are used on the other half. Surface irrigation efficiency can be improved using the following technology:

1. Tailwater reuse to manage runoff water
2. Precision land leveling (laser control)
3. Surge flow irrigation (intermittent water application using semi-automatic control valves)
4. Irrigating alternate furrows rather than every furrow.

There are also methods available for making center pivot irrigation more efficient. Any practice that results in reduced runoff improves efficiency. Tillage practices that reduce runoff include conservation tillage (leaving crop residues on the soil surface) and interrow tillage practices (such as subsoiling after the last crop cultivation and forming microbasins between crop rows). Another method for increasing sprinkler efficiency is to apply nozzle/sprinkler packages that reduce wind drift.

There also are opportunities for water conservation in rain-fed agriculture. The objectives are to reduce evaporation from the soil surface and to reduce runoff. Tillage practices have a large impact. Conservation tillage practices such as no-till and ridge plant can reduce runoff as well as reduce evaporation by leaving crop residues on the soil surface. These residues act as a mulch for reducing evaporation and impede runoff. These systems also require a reduced number of tillage operations during the year. Whenever a moist soil is tilled, moisture is brought to the surface. This leads to more evaporation. In the western part of the state, ecofarming is a good practice for reducing soil moisture losses.

Public Policy Issues for the 1990s

Probably the most important water policy issue facing Nebraskans is how to protect drinking water from contamination by agricultural chemicals. In response to public concern, more stringent regulation of agricultural chemicals to protect drinking water quality will occur in the 1990s.

Nebraska Natural Resource Districts (NRDs) currently are authorized to restrict fertilizer and pesticide applications in order to prevent groundwater contamination in groundwater special protection areas and in groundwater management areas.

Congress is likely to include provisions in the 1990 Farm Bill encouraging low input-sustainable agricultural practices and best management practices to reduce agricultural chemical use.

EPA's proposed Pesticides in Groundwater Strategy will result in pesticide use being restricted or prohibited in areas where pesticide use will contaminate drinking water supplies. Administration of groundwater protection programs in Nebraska in the future may be funded by taxes on pesticides and fertilizers, similar to agricultural chemical checkoffs in Iowa, Kansas, South Dakota, Arizona, and Montana.

Another area of increased public debate will be the issue of instream flows. Various water development groups in Nebraska, Wyoming, and Colorado will increase pressure to impound Platte River water for competing purposes. Wildlife advocates already have attempted to have Platte River stream flow maintained during critical periods for fish and wildlife protection. Compromise efforts have failed, and these instream flow disputes will continue to be litigated in the 1990s. Although Nebraska enacted instream flow protection legislation in 1986, no instream

flow water rights have yet been issued. The law is unlikely to prevent further instream flow litigation.

Groundwater supplies are being depleted gradually in several irrigated regions of Nebraska, including the upper Republican, upper Big Blue, Little Blue, central Platte, and lower Niobrara river basins. Groundwater withdrawals for irrigation deplete groundwater supplies more rapidly than supplies are being recharged from precipitation.

In some regions, irrigated acreage may be reduced up to 40 percent by 2020 if regulations are not established to limit water withdrawals or if suitable and efficient water supply augmentation projects are not developed. Irrigation withdrawals can be reduced significantly by improving irrigation practices and, ultimately, by growing crops requiring less water.

Nebraska follows a local control political philosophy of groundwater management—the decision to establish irrigation regulations is made locally by the NRD. Irrigator political resistance to groundwater regulation has prevented controls from being established in most areas with declining supplies. Continued NRD inaction may result in political pressures to make groundwater depletion control a state rather than a local decision.

A final policy issue is water exports. When the U.S. Supreme Court ruled in 1982 that water was an article of commerce, Nebraska statues severely restricting water exports into another state were invalidated. Some citizens fear that Nebraska water will be exported to meet the water needs of Denver or the Sunbelt. This is highly unlikely because of the massive costs involved. It is much less expensive for municipalities needing additional water supplies to buy irrigation water rights from local farmers and to use that water for municipal purposes. Approximately nine gallons of water are used for irrigation for each gallon of municipal water use. Municipal uses can be expanded considerably with only a modest reduction in irrigation water use through municipal purchase of irrigation water rights. Although the issue of water exports will continue to inflame political passions, the prospect of large water exports from Nebraska to other states is remote.

Summary

A cooperative effort will be required to assure an adequate supply of water to meet the state's competing needs for water resources. This effort will involve a long list of entities and agencies, including all municipalities and other public water suppliers, the legislature, the Department of Health, the Department of Environmental Control, NRDs, agriculture, industry, and many others. The key to any long-term success in maintaining an adequate water supply for all will be a commitment by individual citizens to a stewardship of water resource by practicing conservation and by protecting its quality.

Nebraska Fourth in Metro Population Growth Second in Nonmetro Losses in Seven State Area

The states of Nebraska, Iowa, Kansas, and South Dakota have sustained substantial nonmetropolitan population losses since 1984, while Colorado, Missouri, and Wyoming have experienced increases in nonmetro population during the 1980-1987 period, according to a Bureau of the Census report.

Nebraska's nonmetropolitan population loss of 2.4 percent was exceeded by Iowa's nearly five percent loss 1980-1987. Kansas and South Dakota experienced only about a 1 percent nonmetro population loss for the period.

Colorado showed the most substantial growth in nonmetropolitan population among the seven states, up 7 percent. Wyoming experienced a nearly 6 percent growth, while Missouri's nonmetro areas increased in population nearly 3 percent

In contrast, six of the seven states have shown growth in metropolitan population, with Iowa metro population remaining level.

Among the surrounding states, Nebraska ranked fourth in metropolitan population increases, up 6.3 percent between 1980 and 1987. Colorado's metro population jumped nearly 16 percent, followed by South Dakota and Kansas metropolitan population increases of about 13 percent and 10 percent, respectively.

Overall, Nebraska's total population increased 1.6 percent during the 1980-1987 period. Currently, slightly more than 47 percent of Nebraska's population resides in the state's metropolitan areas, according to the Census Bureau.

In Nebraska, the Lincoln metro area experienced the state's largest metro population increase, up nearly 8 percent between 1980 and 1987.

The Omaha area (consisting of Douglas, Sarpy, and Washington counties) experienced a nearly 6 percent population growth. Sarpy County, the fastest growing county in the state, increased nearly 13 percent.

In the Sioux City metro area, Dakota County showed nearly 3 percent population growth. In addition to Dakota County, the Sioux City metropolitan area includes Woodbury County in Iowa, which experienced a population decrease of 3.2 percent during the 1980-1987 period. The population growth in Dakota County was not sufficient to offset the Woodbury County decrease, resulting in a net decrease in the Sioux City metro area.

Iowa's Pottawattamie County, part of the Omaha metropolitan area, showed a slight population increase of 2 percent for the 1980-1987 period. In addition, two of Iowa's eight metro areas experienced population increases. Iowa City and Des Moines showed a similar 5 percent population growth. The remaining Iowa metro areas experienced decreases ranging from 0.1 to 3.3 percent.

With the decrease in nonmetropolitan, no increase in metropolitan population, and other factors, Iowa's total population declined slightly over three percent between 1980 and 1987. About 43 percent of Iowa's population currently resides in the state's metro areas.

Metropolitan areas in other states showing substantial population growth

include Kansas City, Kansas, up more than 14 percent. during the 1980-1987 period. The Missouri portion of the Kansas City metro area surpassed this figure, with 34 percent population growth. About 53 percent of the total Kansas population resides in the state's metro areas.

Colorado metro population expanded substantially in the seven year period, nearly 82 percent of the state's population now lives in metro areas.

Colorado Springs and the Fort Collins-Loveland metro areas experienced the most substantial population increases of 26 percent and 20 percent, respectively. The Denver-Boulder metro area also had a substantial population gain of 15 percent.

In Missouri, Springfield led the state in metro population growth with a 10 percent increase. Although St. Charles County in the St. Louis, Missouri metro area experienced a 34 percent jump in population between 1980 and 1987, overall population for the state's metropolitan areas increased only four percent. Metropolitan growth was restrained by a nearly 7 percent decrease in the St. Louis population.

Despite the increase in nonmetropolitan population, Missouri's metro areas still account for 66 percent of the population.

South Dakota's two metro areas of Rapid City and Sioux Falls experienced about a 13 percent population growth, resulting in an overall state population increase of nearly 3 percent.

In Wyoming, however, the Casper metro population decreased over 7 percent. This was offset by a Cheyenne population increase exceeding 10 percent, resulting in a net increase in metro population of 1.2 percent for the state.

Patricia C. Dinslage

Temperature Extremes in Nebraska

The lowest temperature ever recorded in Nebraska, -47°F (-44°C), was at Camp Clarke near Northport on February 12, 1899. The highest temperature on record, 118°F (48°C), occurred on July 15, 1934 at Geneva; on July 17, 1936 at Hartington; and on July 24, 1936 at Minden.

Merlin W. Erickson

Review and Outlook

John S. Austin

National Economy

The long anticipated weakness in the national economy has appeared in the current quarter. The foreseen softening is not sufficient to be classified as a recession. When fourth quarter data are released January 26, 1990, it is anticipated that growth in real GNP will run between 0.5 percent and 1.0 percent. Just as automobile sales contributed to a strong third quarter, the weakness in the fourth quarter will be related to the auto sector. Auto sales and production will be a leading factor in lackluster fourth quarter growth.

Third quarter GNP figures recently have been revised upward. They now indicate that the third quarter grew 2.7 percent in real terms. As we previously predicted, a major factor in the revision is a decrease in the strongly negative net export figure. The change was anticipated because the September trade figures showed a sharp reduction in imports and a modest increase in exports. The principal strength in the third quarter was the auto sector. Rebates and low interest financing were used to move the last of the 1989 models. In essence, the auto producers transferred sales from the fourth quarter to the third quarter.

Auto sales are already weak in October and in early November. Furthermore, it is highly unlikely that December sales this year will meet the torrid pace of auto sales a year ago, when autos sold at the seasonally adjusted annual rate of 11.4 million units. Anticipating continued weakness in auto sales, domestic producers have cut production plans. Fourth quarter domestic production plans are at their lowest level since the fourth quarter of 1982, the end of the largest post-World War II recession this country has experienced. All of the cuts will come from the big three producers. Japanese joint venture firms will expand their production 44 percent. Total U.S. production will fall 11.7 percent for cars and 11.1 percent for trucks if current production plans are maintained.

Weak auto numbers also were reflected in the Industrial Production Index. The Industrial Production Index fell 0.7 percent in October. Contributing to the drop were lost work days due to the San Francisco earthquake and to a strike at Boeing. The Boeing strike already is settled. With the cutback in auto production, it is unlikely that the Industrial Production Index will grow in the fourth quarter. Despite increasing difficulties in the industrial production sector, the unemployment rate remained at 5.3 percent in October.

Retail sales also reflect the weakness in the auto sector. In October, total retail sales were down 1.0 percent. When autos are removed from the retail sales figure, retail sales showed a slight increase of 0.2 percent. These numbers are reported in current dollars. If one were to subtract any reasonable measure of inflation, retail sales would show no growth. Anecdotal evidence from major retailers indicates that November sales have been weak. The prognosis for this December is that current dollar sales will show a slight increase over last December. It appears that the consumer is playing a cat and mouse game with the retailer. For several years, retailers have held major sales in December. Consumer now expect those sales and will wait for them to occur. Most analysts suggest that in real terms, retail sales in December will be close to those of last year.

Amidst all the gloom, is there any reason for hope? The rebuilding activity after Hurricane Hugo and the San Francisco earthquake will contribute to future growth through increased construction spending. Because the seasonal factors for this time of year are relatively low, the seasonally adjusted November and December data may tend to overstate actual construction activity. The positive impact of the disasters shows the frailty of economic accounts. After all, rebuilding is only a replacement of lost capital stock. We do not advocate disasters or war to improve the economy.

Low interest rates should stimulate the economy. We expect housing starts to respond to lower interest rates in the near

future. The October recovery in housing starts may be a harbinger for the residential construction industry.

The settlement of the Boeing strike not only will improve the Industrial Production Index figure slightly, but also should benefit the export figures. The airframe manufacturers are having a good export year.

A natural question is whether the evidence we are seeing now is a precursor of a recession or merely a pause. Economists are notable for their inability to forecast recessions, especially in terms of timing. Therefore, it is only partly reassuring that only a handful economists currently foresee a recession. The consensus forecast calls for growth rates hovering around 1 percent on an annual basis the next two to three quarters.

On the bright side, inflation has moderated. In October the Producer Price Index increased 0.4 percent. With OPEC agreeing to an expansion of output, there is room for some optimism on future energy prices. The price of West Texas crude remains below $20 per barrel. The Consumer Price Index advanced 0.5 percent in October. Part of that small increase in the Consumer Price Index is related to the increased energy prices earlier in the year.

With industrial production falling sharply, capacity utilization rates have dwindled somewhat in the last few months. Capacity utilization rates are key elements in industrial price inflation. Lower interest rates will not only stimulate the housing market, but could stimulate nonresidential investment expenditures as well. Increased nonresidential investment may result in even lower capacity utilization figures, further easing inflationary pressures.

Personal income is strong, increasing in October 0.9 percent. That jump was unique, reflecting bonuses to automobile workers for their efforts in the third quarter and an increase in farm subsidy payments. Those two factors were offset by losses due to Hugo and the San Francisco earthquake. At the same time, consumer spending dropped 0.2 percent, reflecting the fall in auto sales. The result is a dramatic increase in the savings rate, from 4.7 percent in September to 5.7 percent in October. That rate likely will drop in the coming months.

Next month, we will examine the outlook for 1990 in some detail as we prepare for the State of the State conferences.

Table I
National Indicators

	Annual		Quarterly (SAAR)			
	1987	1988	1988:II	1988:III	1988:IV	1989:I
Real GNP (percent change)	3.7	4.4	2.7	3.7	2.5	2.7
Real Consumption (percent change)	2.8	3.4	3.0	2.0	1.9	6.2
Housing Starts ($ millions)	1.6	1.5	1.6	1.5	1.4	1.3
Auto Sales ($ millions)	10.3	10.6	10.5	9.8	10.3	10.7
Interest Rate (90 day T-bill)	5.8	6.7	7.7	8.5	8.4	7.8
Unemployment Rate (percentage)	6.2	5.5	5.3	5.2	5.3	5.2
Industrial Production Index (1977=100)	129.8	137.2	139.9	140.7	141.8	142.2
Money Supply, M2 (percent change)	6.6	5.1	3.6	1.8	1.2	7.3

NOTE: SAAR — Seasonally Adjusted at Annual Rates

Table II
Employment in Nebraska

	Revised September 1989	Preliminary October 1989	October % Change vs. Year Ago
Place of Work			
Nonfarm	715,806	723,036	3.5
Manufacturing	99,429	100,461	3.6
Durables	47,806	47,861	1.5
Nondurables	51,623	52,600	5.6
Mining	1,903	1,915	24.4
Construction	27,484	28,017	6.5
TCU*	48,195	48,788	5.9
Trade	182,719	184,261	2.5
Wholesale	52,803	53,430	5.5
Retail	129,916	130,831	1.4
FIRE**	49,132	48,852	1.3
Services	168,163	169,115	5.9
Government	138,781	141,627	1.4
Place of Residence			
Civilian Labor Force	811,309	826,399	-0.82
Unemployment Rate	2.9%	2.7%	

*Transportation, Communication, and Utilities
**Finance, Insurance, and Real Estate

Source: Nebraska Department of Labor

Table III
Price Indices

	October 1989	% Change vs. Year Ago	YTD % Change vs. Year Ago
Consumer Price Index - U* (1982-84 = 100)			
All Items	125.6	4.5	4.9
Commodities	118.1	4.1	4.8
Services	133.7	4.8	4.9
Producer Price Index (1982 = 100)			
Finished Goods	114.8	5.0	5.2
Intermediate Materials	112.3	3.4	5.1
Crude Materials	101.8	6.3	7.1
Ag Prices Received (1977 = 100)			
Nebraska	152	-0.7	7.2
Crops	124	-10.8	15.7
Livestock	169	4.3	3.4
United States	144	0.7	7.4
Crops	127	-4.5	9.5
Livestock	160	5.3	6.0

U* = All urban consumers
Source: U.S. Bureau of Labor Statistics

Nebraska Outlook

Unemployment levels in Nebraska remain extremely low. In the month of October, the unemployment rate was 2.7 percent—half the national rate. Nebraskans can pat themselves on the back for having created large numbers of new jobs. In October, jobs increased 3.5 percent over year ago levels (see Table II).

Nebraska retail sales rebounded in August from their low July levels (Figure II). Nevertheless, retail sales on a current dollar basis are still below those of March. Retail sales in constant dollar terms are below December 1988 levels.

Relatively dry moisture conditions continue to prevail in the state. Subsoil moisture in November was rated 95 percent short. Although that was beneficial to the harvest, winter wheat crops would benefit from a good soaking rain before the soil freezes.

The apparent end of the the Cold War could have long-term beneficial effects for the Nebraska economy. Initially there could be a surge in exports of food and food products to eastern Europe. There is no guarantee, however, that the new governments will be able to reorganize their economies in a timely manner. While the demand for food products exists, demand without money to back it is meaningless.

In the long run, eastern Europe could be a market for U.S. agricultural equipment. But,should the eastern Europeans be able to reorganize their agricultural industries, it could mean a long-term decrease in their demand for U.S. ag products.

Nebraska construction activity continues to run counter to national trends. According to F.W. Dodge reports, October saw a surge in total building activity in terms of new contracts. On a year-to-date basis, total building square footage contracts have advanced 22.5 percent. Total projects in the state, including both building and nonbuilding, have increased 16.7 percent on a year-to-date basis.

Table IV
City Business Indicators
August 1989 Percent Change from Year Ago

The State and Its Trading Centers	Employment (1)	Building Activity (2)
NEBRASKA	-0.3	7.6
Alliance	0.0	-6.9
Beatrice	0.8	3.6
Bellevue	0.4	-5.2
Blair	0.4	-11.7
Broken Bow	0.6	-1.1
Chadron	0.6	-18.8
Columbus	0.4	-5.4
Fairbury	0.4	-25.6
Falls City	0.5	14.6
Fremont	0.2	53.7
Grand Island	0.3	-3.9
Hastings	0.1	-14.7
Holdrege	0.5	-33.0
Kearney	0.4	23.8
Lexington	0.3	33.6
Lincoln	0.2	18.4
McCook	-0.2	36.1
Nebraska City	0.5	122.2
Norfolk	0.4	7.6
North Platte	0.0	49.4
Ogallala	0.4	-0.8
Omaha	0.4	1.5
Scottsbluff/Gering	0.2	-13.7
Seward	0.3	-14.8
Sidney	0.2	-18.3
South Sioux City	0.3	-7.9
York	0.4	-1.3

(1)As a proxy for city employment, total employment (labor force basis) for the county in which a city is located is used

(2)Building activity is the value of building permits issued as a spread over an appropriate time period of construction. The U.S. Department of Commerce Composite Cost Index is used to adjust construction activity for price changes

Sources: Nebraska Department of Labor and reports from private and public agencies

Figure I
City Business Index
August 1989 Percent Change from Year Ago

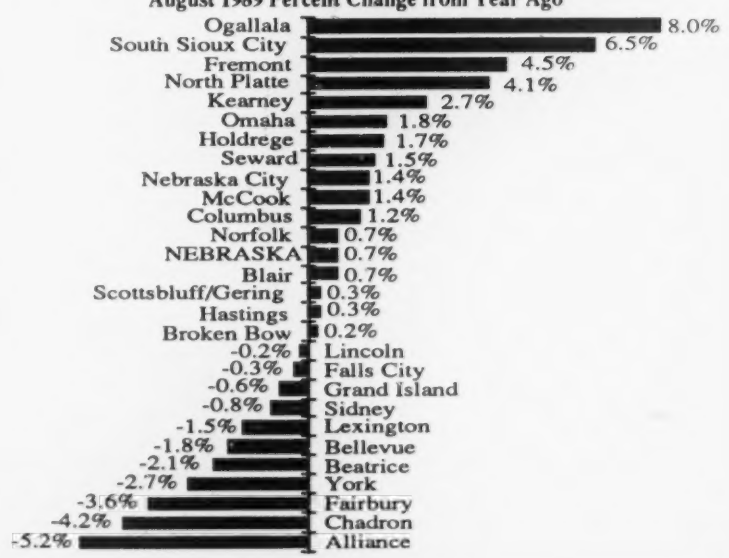
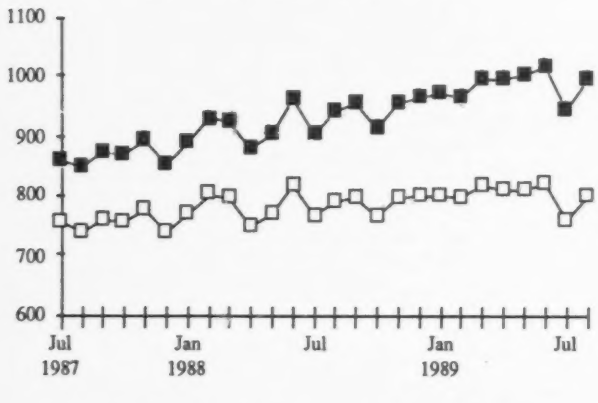


Table V
Net Taxable Retail Sales of Nebraska Regions and Cities

Region Number and City (1)	City Sales (2) August 1989 (000s)	City Sales (2) % Change vs. Year Ago	Region Sales (2) August 1989 (000s)	Region Sales (2) % Change vs. Year Ago	Region Sales (2) YTD % Change vs. Year Ago
NEBRASKA	$884,740	5.5	$1,035,894	6.3	7.7
1 Omaha	317,633	7.9	399,843	8.5	9.4
Bellevue	12,597	0.2	*	*	*
Blair	4,138	7.0	*	*	*
2 Lincoln	122,189	1.8	144,091	3.5	4.5
3 South Sioux City	5,283	20.2	7,434	13.5	4.4
4 Nebraska City	3,509	-2.1	18,177	2.4	2.0
6 Fremont	15,876	9.8	29,711	8.3	5.4
West Point	2,742	12.8	*	*	*
7 Falls City	1,778	1.4	8,440	6.1	0.0
8 Seward	4,246	9.3	14,358	1.2	2.3
9 York	6,436	-2.2	15,387	-0.7	9.5
10 Columbus	14,552	7.3	26,351	5.2	5.8
11 Norfolk	18,905	4.7	33,207	3.4	7.6
Wayne	2,563	3.6	*	*	*
12 Grand Island	34,727	3.0	49,419	2.3	9.3
13 Hastings	16,119	6.8	25,915	8.0	7.7
14 Beatrice	6,887	-1.9	16,753	-1.4	0.7
Fairbury	2,611	-1.3	*	*	*
15 Kearney	21,450	7.7	30,113	6.8	10.1
16 Lexington	5,430	-2.8	16,361	4.7	6.8
17 Holdrege	4,277	12.2	8,594	10.2	6.6
18 North Platte	17,001	9.4	21,874	10.5	5.2
19 Ogallala	7,045	22.7	13,076	15.8	12.8
20 McCook	7,981	4.2	11,638	4.9	4.0
21 Sidney	3,984	4.5	7,976	-5.5	1.6
Kimball	1,682	-13.0	*	*	*
22 Scottsbluff/Gering	18,070	6.4	25,487	4.3	10.3
23 Alliance	4,697	-7.1	14,614	5.2	2.1
Chadron	2,588	-3.9	*	*	*
24 O'Neill	4,198	12.0	14,527	11.9	12.1
Valentine	2,774	14.1	*	*	*
25 Hartington	1,279	-10.6	8,113	-3.6	1.4
26 Broken Bow	3,326	4.2	12,283	4.3	6.4

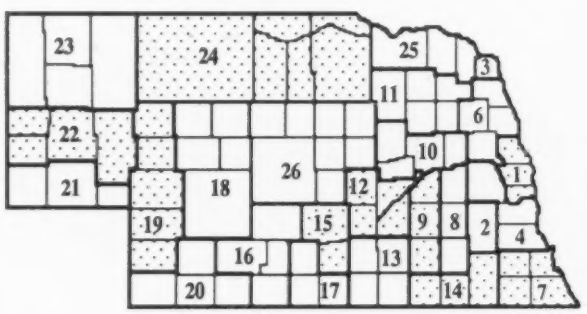
(1) See region map
(2) Sales on which sales taxes are collected by retailers located in the state. Region totals include motor vehicle sales
* Within an already designated region
Compiled from data provided by the Nebraska Department of Revenue

Figure II
Nebraska Net Taxable Retail Sales
(Seasonally Adjusted, $ Millions)



(1) The Consumer Price Index (1982-84 = 100) is used to deflate current dollars into constant dollars

Figure III
Region Sales Pattern
YTD as Percent Change from Year Ago



Shaded areas are those with sales gains above the state average. See Table V for corresponding regions and cities

Make Your Reservation Today

Now is the time to make your reservation for the second annual State of the State conferences:

* Ogallala, Holiday Inn, January 16, 1990
* Lincoln, Nebraska Center for Continuing Education, January 23, 1990
* Omaha, Holiday Inn, I-80 at 72nd Street, February 1, 1990

For reservation information, contact the Bureau of Business Research, 402/472-2334 or write: Bureau of Business Research, 200 CBA, University of Nebraska - Lincoln, Lincoln, NE 68588-0406

It's The Water . . .

The Popcorn Institute says it's the water that makes it pop! Popcorn kernels are composed of carbohydrate, protein, fat, and water. In each kernel, water is stored in a small circle of soft starch. As the kernel is heated, the moisture heats, builds pressure, and swells to fill any available room. When the outer surface gives way, the water further expands, causing the popcorn to explode. The soft starch pops out, the kernel turns inside out, steam inside the kernel is released, and the corn pops. Processors generally adjust the moisture level in popcorn to 13.5 percent or 14 percent to ensure maximum popability.

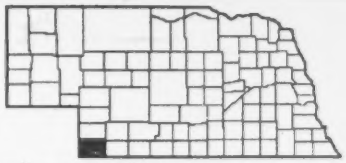
Nebraska growers produced 82.9 million pounds on 24,100 acres in 1986. Indiana, Illinois, and Ohio typically are the largest producers; however, 1988 popcorn production in each of these states was less than in Nebraska due to the drought. In 1988 Nebraska produced 111.2 million pounds, about 22 percent of the nation's popcorn output.

Americans consume 12.9 billion quarts of popped popcorn annually, 52 quarts per man, woman, and child. Approximately 70 percent of this total is eaten in the home and about 30 percent outside the home (theaters, stadiums, schools, etc.) Unpopped popcorn accounts for approximately 90 percent of sales for home consumption.

Merlin W. Erickson

County of the Month

Dundy



Benkelman--County Seat

Size of county: 577 square miles, ranks 47th in the state
Population: 2,700 (estimated) in 1988, a change of -6.4 percent from 1980
Median age: 38.4 years in Dundy County, 29.7 years in Nebraska in 1980
Per capita personal income: $18,979 in 1987, ranks 4th in the state
Net taxable retail sales ($000): $11,471 in 1988, a change of +11.0 percent from 1987; $7,855 during January-August 1989, a change of +4.9 percent from the same period one year ago
Number of business and service establishments: 72 in 1986; 72.2 percent had less than five employees
Unemployment rate: 1.4 percent in Dundy County, 3.6 percent in Nebraska for 1987
Nonfarm employment (1988):

	State	Dundy County
Wage & salary workers	688,146	640
	(percent of total)	
Manufacturing	13.8%	0.4%
Construction and Mining	3.8	5.2
TCU	6.5	7.5
Retail Trade	18.5	17.2
Wholesale Trade	7.3	7.5
FIRE	7.0	2.3
Services	23.0	21.9
Government	20.1	38.0
Total	100.0%	100.0%

Agriculture:
Number of farms: 389 in 1987, 382 in 1982
Average farm size: 1,379 acres in 1987
Market value of farm products sold: $55.8 million in 1987 ($143,400 average per farm)

Sources: U.S. Bureau of the Census, U.S. Bureau of Economic Analysis, Nebraska Department of Labor, Nebraska Department of Revenue

Merlin W. Erickson

Business in Nebraska

PREPARED BY BUREAU OF BUSINESS RESEARCH
Association for University Business & Economic Research

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December 1989, Volume 45 No. 543

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